Organic and IPM Programs: Areawide Pest Management

Peshastin Creek Project Year II Monitoring

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The Peshastin Ck. Areawide Project

• The Peshastin Creek Growers Association
  ▪ Association of local growers and fieldmen
    • Mission: Increase the use of environmentally-friendly pest management techniques to enhance water and soil quality, improve worker safety and reduce pesticide inputs

• Pest Management Program
  ▪ Based on Organic insect management practices
    • Areawide techniques to control Pear psylla and Codling moth
    • Reduce non-selective pesticide use
    • Increase potential migration of beneficial insects
In 2002

- PCG Assoc. was formed
- Preliminary monitoring and analysis
- Equal effectiveness
  - Levels of pest control
  - Levels of predators
  - Cost of pesticide inputs
    - Full Cost/Benefit analysis not yet completed
2003 Monitoring

• Comparison of 3 management types
  ▪ **Organic**—91 acres
    ▪ Organic management techniques
    ▪ Surround, Oil, Sulfur, Azadirachtin, Bt, Spinosad, CM granulosis virus and Mating disruption
  ▪ **Soft**—82 acres
    ▪ Prefer organic methods, use IGRs and selective pesticides
    ▪ Surround, Oil, Sulfur, Avaunt, IGRs, and MD
    ▪ Endosulfan, Carzol, Actara used prebloom
  ▪ **Conventional**—56 acres
    ▪ Standard pest management techniques
    ▪ Surround, Oil, IGRs, Carzol, Chloronicotinyls, Abamectin, Organophosphates and MD
2003 Monitoring

• Area
  - Peshastin Creek Valley, WA
    • Blewett Pass Hwy 97
  - 230 ac. sampled
    • ~300 ac. of pears in the valley
  - 41 plots
    • 1.5 to 10 ac. in size

• Changes from 2002
  - Increase in sampling coverage and precision
    • Sample sites increased 22 ➔ 41
    • Plots defined as orchard blocks
      • Grower management units
2003 Monitoring

• Pest Monitoring
  ▪ Sampled weekly
  ▪ Pear psylla
    • Adults—late March through early Sept.
    • Eggs and Nymphs—April to Sept.
  ▪ Mites etc.—TSSM, ERM, PRM, GMB
  ▪ Codling moth
Codling Moth Monitoring

• One trap/block, upper \( \frac{1}{3} \)rd of canopy
  - Average of 1 trap/ 5.6 acres
  - Delta traps with Pherocon cap lures
    • 10 mg lures in mating disruption
    • 1 mg lures in blocks w/out MD

• Late April through late Sept
  - Checked once/week

• Degree day modeling
  - 12 weather monitoring stations
CM Damage Evaluations

• 1,000 fruit/block
  ▪ 50 trees/block
    • 10 fruit low and 10 fruit high/tree

• 1st generation
  ▪ 16 July – 29 July
    ▪ ~½ of high counts done from ladders

• 2nd generation
  ▪ 28 Aug – 10 Sept
    ▪ All counts from the ground
Predator Monitoring

- Sampled with adult PP
  - 25 limb-taps/block

- Beneficial Insects
  - Spiders, Deareocorids, Ladybird beetles, Snakeflies, Lacewings, Anthocorids, Campylomma, predatory mites...
Results

• Analysis
  ▪ ANOVAs
    • Data normalized using Box-Cox ($x+1$) transformations
  ▪ Fisher’s Protected Least Squares Differences Tests
Pear Psylla Densities

- **Adults**
  - Averaged over entire season
    - Higher in ORG than CONV
  - No significant differences until late season
    - ORG blocks higher than both CONV and SOFT
Pear Psylla Densities

- **Adults**
  - All showed lower densities in 2003 than in 2002
  - Rescaled 2003 graph

![Graph of Pear Psylla Densities](image-url)

- Mean # PPA/ tray sample
- 2002 PP
- Conventional, Soft, Organic
PP densities

- **Nymphs**
  - Few small differences through season

- **Eggs**
  - No differences throughout season

![2003 Nymphs graph]

![2003 Eggs graph]
PP densities

- Nymphs
- Eggs
- Densities lower in 2003 than in 2002
  - Rescaled 2003
Mites and Other Pests

• Pear Rust Mite
  - Problematic in some ORG and SOFT
  - Damage high in one ORG orchard (3 blocks) w/o adequate prebloom treatments of sulfur
    - No available postbloom
  - No statistical differences

![PRM Densities Chart]

Madsen and Dunley, January 2004. WSU-TFREC
Mites and Other Pests

- Two-spotted spider mites, European Red mites, Grape mealybugs
  - Pressure low in 2003
Codling Moth Pressure

- First generation
  - Trap catch extremely variable between blocks
  - ORG captures higher than other blocks
    - Two hot-spots account for most of ORG catch
Codling Moth Pressure

- 2nd generation
  - ORG moth captures higher than SOFT
  - Neither significantly different from CONV
CM Damage

• Most damage 2\textsuperscript{nd} generation

• No significant differences between programs

% CM Damage, 2003

- 0.73%
- 0.54%
- 0.01%
CM Damage

- Two notable occurrences of 2nd generation damage
  - **CONV** block: sprayable pheromone
  - **ORG** block: no Cyd-X, only 1 spinosad
CM Damage vs. Pressure

CONV CM control program: Sprayable MD, 1 Avaunt

ORG (1) CM control program: No-Mate MD, 3 Entrust, 4 Cyd-X

Madsen and Dunley, January 2004. WSU-TFREC
CM Damage vs. Pressure

ORG (1) CM control program: No-Mate MD, 3 Entrust, 4 Cyd-X

ORG (2) CM control program: No-Mate MD, 1 Entrust

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Predator Densities

- Remained low through most of the season
  - Late season increases in ORG and SOFT
  - Densities similar to 2002
Materials cost for insect pest control

- 2003
  - No significant differences between programs

2003 Mean Cost for Insect Pest Control

2003 Cost Distribution

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Materials cost for insect pest control

- **2003**
  - Slightly higher costs
    - High CM pressure in 2003
- **2002**
  - No differences in programs

### 2002 Cost Distribution

<table>
<thead>
<tr>
<th></th>
<th>ORG</th>
<th>SOFT</th>
<th>CONV</th>
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<tbody>
<tr>
<td>Mean</td>
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<td>500</td>
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</tr>
<tr>
<td>Median</td>
<td>300</td>
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</tr>
<tr>
<td>Max</td>
<td>600</td>
<td>600</td>
<td>600</td>
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![2002 Mean Program Cost](chart.png)
Materials cost for insect pest control

- Allocation by pest
  - ORG spent a greater proportion on CM than did SOFT or CONV

![Graph showing allocation of spray cost to PP, CM]

**CM Cost Allocation**

<table>
<thead>
<tr>
<th>% of Spray Cost to CM</th>
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<tbody>
<tr>
<td>70%</td>
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<tr>
<td>60%</td>
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<tr>
<td>50%</td>
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<td>40%</td>
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<td>30%</td>
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<tr>
<td>20%</td>
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<tr>
<td>10%</td>
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<tr>
<td>0%</td>
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</tbody>
</table>

Conv | Soft | Org

ave %cost for PP ave %cost for CM

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Discussion

• Pear psylla densities
  ▪ Lower in 2003 relative to 2002, all 3 programs
  ▪ Adult PP
    • Greater in ORG relative to CONV
      ▪ Difference occurred near harvest
  ▪ PP Nymphs
    • Below economic threshold in all 3 programs
Discussion

• Two-spotted spider mites, GMB
  ▪ Pressure low in 2003
  ▪ Management consistently effective

• Pear rust mites
  ▪ Problematic for SOFT and ORG programs
    • Inadequate prebloom control ➔ economic damage in 3 related ORG blocks
  ▪ Lack of available postbloom interventions a limitation to selective programs
Discussion

• Codling moth
  ▪ Pressure high in several SOFT and ORG blocks
    • SOFT blocks
      ▪ Intrepid and Avaunt with Mating Disruption
      ▪ Successful in controlling CM
    • ORG blocks
      ▪ Entrust (spinosad) and Cyd-X (codling moth virus) with MD
      ▪ Very effective in controlling very high pressure
Discussion

• Predators
  ▪ Present in low numbers
  ▪ Late-season increases in SOFT, ORG
    • Follow increase in PP densities
    • May never see large numbers of predators
      ▪ Damage thresholds for pear psylla may be too low to sustain higher densities of natural enemies
Discussion

• Materials costs for programs
  ▪ Statistically equivalent
  ▪ SOFT program most variable in cost
  ▪ Variability based on:
    The Ghost of Pest Problems Past
    • Historic pest densities
      ▪ Carryover of pests ➔ problems in current year
    • Expectations
      ▪ What chemicals can (should) do
    • Tolerance of pest levels
Cost allocations by pest

- Given that
  - Mean program costs are $= $, and allocations to pests are $\neq$
  - Suggests that CM $\neq$ PP as a pest
- We know:
  - Soft/Organic chemicals less effective, expensive

- Cost, effectiveness of materials matters for CM
  - high cost in ORG for CM

- but not for PP
  - low cost in ORG for PP (despite less effective chemicals)
    - ???
    - Biocontrol
      - Even though we don’t see numbers
Conclusion

• Organic and near-organic Soft pest management strategies
  ▪ Successful Pest Control?
    • Over a two year period, relative to Conventional
    • YES
  ▪ Cost comparable?
    • YES

• Further analyses
  ▪ Currently being conducted
    • Fruit yield and quality
    • Cost and return
    • Grower satisfaction
  ▪ A third year of study
Thank you

• And thanks to
  ▪ The Peshastin Creek Growers Association
    • Growers
    • Co-operating fieldmen

• And for funding from
  ▪ IFAFS/RAMP
  ▪ WA-TFRC